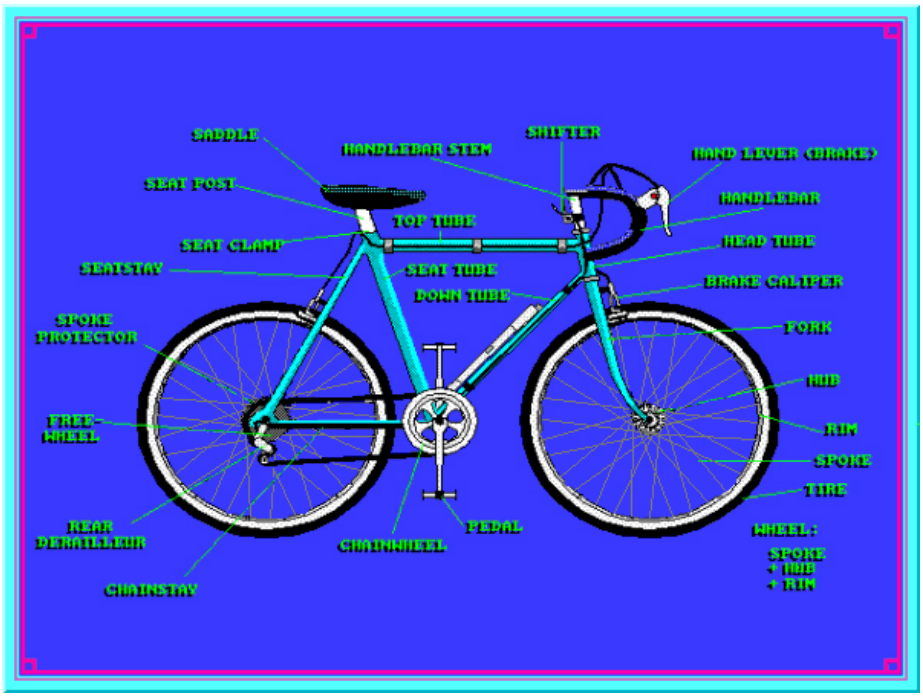
Bike Tune Up

March 14, 2007

Contents


SADDLE
HANDLEBAR STEM
SHIFTER
HAND LEVER (BRAKE)
SEAT POST
HANDLEBAR
TOP TUBE
SEAT CLAMP
HEAD TUBE
SEATSTAY
SEAT TUBE
BRAKE CALIPER
DOWN TUBE
SPOKE PROTECTOR
FORK
HUB
FREE-WHEEL
RIM
SPOKE
TIRE
REAR DERAILLEUR
PEDAL
WHEEL:
SPOKE + HUB + RIM
CHAINWHEEL
CHAINSTAY

What You Will Need For Tuning Your Bicycle:

- This Presentation
- An adjustable wrench or set of wrenches
- Tongue and groove pliers, sometimes called "channellocks"
- Bicycle bearing cone wrenches (approx. $8 at bike stores)

Figure 1: cone wrench

- Oil, grease, and non-flammable, non-toxic cleaning solvent
- A couple of screwdrivers
- A freewheel remover (maybe)

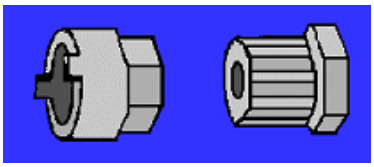


Figure 2: Freewheel Remover

- Patience - This is the most important ingredient

What if you get in over your head?

Ask a friend, or call the mechanic at the local bike shop for advice. In the worst case, you would have to take the bike into the shop and pay for professional help, which would still cost less than a complete tune-up anyway.

Step 1: Adjust Headset

Some modern bikes have sealed, non-adjustable headset bearings. All others require checking the adjustment even if they are sealed.

While the bike is on the floor, use two tests to check your headset adjustment. First, lift the front wheel off the ground by holding the top tube of the frame. If the headset is loose enough, the handlebar and front wheel will flop to one side or the other. Next, apply the front brake or hold the front wheel from turning, and push the bike back and forth an inch or two on the floor. A loose headset will click a little.

A headset which is loose will wear out soon. One which is already worn out will be gravelly or self-centering like an old-fashioned bar stool. This will impede safe steering. A headset which is too tight will also make steering difficult.

The bikes headset adjusts like most bike bearings. There is an adjustable cup or cone at the top, and a locknut above that. By screwing the adjustable cone or cup closer to the bearings, the adjustment gets tighter. On many headsets there is an interlocking mechanism that means you will have to loosen the locknut several turns. On some there are two locknuts that must be loosened before you can make the adjustment. One may be hidden under a reflector bracket, or brake cable holder.

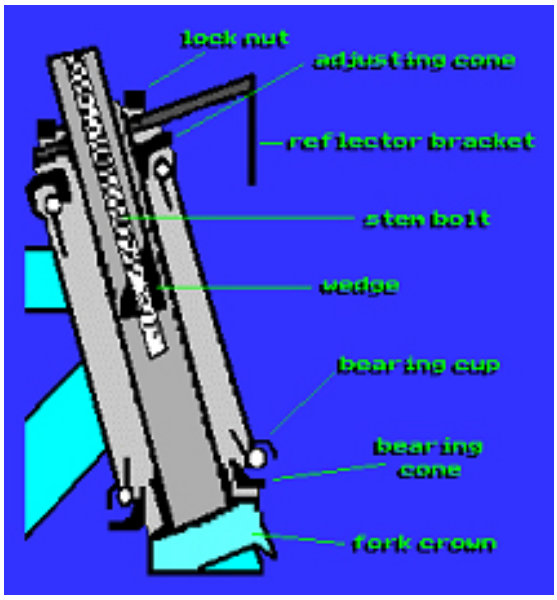


Figure 3: Headset

Two types of bicycle handlebar stems are in current use. The most modern type

clamps around the top of the bikes fork and is tightened with one or two allen head bolts. If you ride in all types of weather, the bolts should be removed, greased, and retightened. With any steel bolts that thread into aluminum alloy, a thin coating of grease is helpful years down the line, when corrosion would otherwise lock them together.

The older style is called a 'threaded stem,' and has an interesting design. In order to adjust the stem height, you must first loosen the top stem bolt two or three turns and then bang it down with a soft hammer. This releases an internal wedge. While the stem is loose, take it out and grease the shaft of the stem and the wedge threads. To reinstall, tighten the bolt once you are satisfied with the position. There must be at least 2-1/2 inches of handlebar stem inserted into the fork. Check to see that the stem is properly tight by trying to turn the handlebar while trapping the front wheel between your knees. Also check that the handlebar is secure in the stem.

Figure 4: Older style, but still common 'threaded' stem. Long bolt at left goes through stem, pulls wedge tight against inside of steering tube (fork).

If you feel that the bicycles handlebar is too low, and the stem cannot be raised enough, consider purchasing a taller handlebar.

Step 2: Bottom Bracket Adjustment

There are several design variations of the bicycles bearings between the pedals, called the bottom bracket, or crank bearings. Whatever type you have, the adjustment is performed in the same way, however:

If your bike has sealed, non-adjustable bottom bracket bearings, skip ahead to the information below about bicycle cranks and bicycle pedals. Many modern bikes have sealed bearings, but they may still require adjustment.

Loosen the bike's outer locknut or ring (which is left-hand threaded on most American-made bikes, so to loosen, you'd turn it clockwise), turn the inner nut or "cup" to get the proper adjustment, and then re-tighten the locknut or ring. You may need to try this several times to get it right. Check the adjustment with the chain off. There should be no bearing looseness and yet the cranks should spin freely.

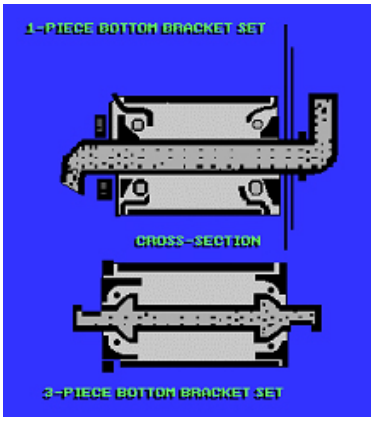


Figure 5: Bottom Bracket

Many older style bikes have crank cotters. These are special bolts with a tapered, flattened side. One goes through each crank, holding it to the crank axle ("spindle"). In time they become worn, which causes a clunky looseness as you turn the pedals. To replace a cotter, remove the nut, and carefully hit the threaded end with a hammer. Normally, the cotter will slip out of its hole. If it doesn't, try to avoid killing it with your hammer. You may need to heat up the crank, or drill the cotter out. Put grease on the new cotter, tighten the nut on, tap it lightly with a hammer and retighten it. Cotters are soft steel, so don't overtighten the nut.

Many newer bikes have "cotterless" cranks. These have a bolt or nut usually under a metal or plastic cap on each side. These bolts must be kept tight or you can damage the cranks. Check these bolts every month or two. Cotterless

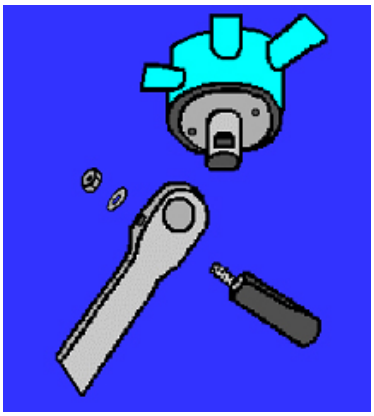


Figure 6: Crank Cotter

cranks cannot be removed reliably without a special tool available at bike shops. Fortunately, this tool is low-cost, generally under twenty dollars.

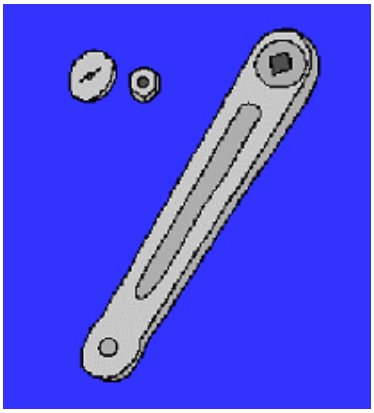


Figure 7: Cotterless Crank - Keep the nuts tight!

Pedals

Check that the pedals are tight on the cranks, especially in the winter. The left side pedal is always left-hand threaded. Turn it the opposite of a jar lid to remove or put on.

If you remove pedals, you should put a thin coat of grease on their threads, because pedals in contact with cranks for a long time tend to become stuck due to rust or electrolytic action.

If you have a stuck pedal, put a wrench on it, and bang on the end of the wrench with a soft hammer. Wear goggles, since the wrench may jump or chip. Do not use a wrench you care about, because it may stretch or break. Bicycle shops can sell you a long pedal wrench which gives you more leverage, and is especially thin to fit on some pedals which do not have much room for a regular wrench. If you have a pedal you want to remove which is very resistant, heat the end of the crank. Heat the crank only until a drop of oil applied to it starts to smoke. Any more than that, and the heat may destroy the metal of the crank.

It is very important not to mix up the pedals, since the left pedal is left-threaded. Putting the wrong pedal on the wrong crank can damage the threads. Most pedals are marked with an "L" and an "R" to help you distinguish.

Step 3: Adjust The Front Wheel Bike Hub

Although many modern bicycles have non-adjustable, wheel hubs, many still require adjustment. If your bike has "cartridge" or non-adjustable hubs, you can skip this section. "Sealed" only means that your hubs have seals to help keep dirt and water out, but does not identify whether your hubs are adjustable. Your bike shop can help you figure out what you have.

If the hubs are too tight or too loose, you will soon damage the parts.

By setting the hub cones close together, the adjustment becomes tight. Screwing them farther apart causes looseness. When a wheel is off the bike, set the adjustment to very slight wiggliness, because clamping the wheel into the bike compresses the hubs slightly. Once installed, there should be just barely detectable looseness at the rim, or none at all.

On many American bikes, you simply turn one of the cones before tightening the axle nuts that hold the wheel on the bike.

Most others have thin locknuts that are jammed against the cones to keep the adjustment from drifting. To operate on this type, loosen the locknut on one side, use thin "cone wrenches" to change the adjustment, then retighten the locknut.

Figure 8: Cone Wrench

If it is impossible to adjust the wheel so that the hubs are not too tight and not too loose at the same time, or if the hubs feel gravelly when turned, an overhaul is recommended to examine the parts for wear, and replace whatever is needed.

If the side of the wheel hub looks particularly dirty, and if the hubs are not sealed, then overhaul is a good idea to clean out the old, dirty grease, and replace it with fresh grease.

To overhaul the hubs, unscrew one locknut and hub cone from the axle over a cloth. In most hubs, the balls will fall out. Clean everything as much as

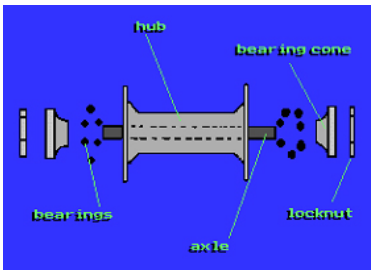


Figure 9: Hub

you can, using a non-flammable, safe-to-breathe solvent. Examine everything for wear, especially the hub cones, the cups (inner surfaces of the hub) and the balls. The bearing balls should be shiny, not dull. Although rare, you should check for cracking of the hub body itself, especially around the outsides of the cups. Put fresh grease in the cups, stick the hubs into the grease, put the cones and locknuts back on the axle, and adjust properly.

If your hub has cages that hold the balls in groups, note which way they fall out, and put them back the same way. Almost always, the balls face each other, and the backs of the cages face toward the outside.

Step 4: Adjust Rear Wheel Hubs

Coaster brake and three-speed hubs have bearings just like front wheels, and are adjusted in nearly the same way.

Coaster Brake

Wheels On most coaster brakes, you must make the adjustment on the right hand (sprocket) side.

Three-Speed Wheels

A Sturmey-Archer or Suntour three-speed hub with a little "indicator" chain must be adjusted only on the left (non-sprocket) side of the hub.

If your bike has a Shimano three-speed with the lever on the right side, then it is adjusted only on the right (sprocket) side of the hub.

Derailleur-Equipped and BMX Bicycle Wheels

On derailleur-equipped bikes, you need to take the freewheel off to adjust the cones properly. You'll need a specific freewheel remover tool for your brand of freewheel. There are about six common types. Take your bike to the bicycle store so they can see what you need and sell you the right one. Most freewheel removers are under twelve dollars.

Insert the remover fully. If it is the type with prongs, screw the axle nut or quick release skewer back on loosely to keep the tool from slipping. Grab the remover in a vise or with a large wrench and unscrew it counter-clockwise (like a jar lid). It may be quite tight. If you are using the pronged type remover, after the freewheel is loosened, remove the axle nut or quick release skewer, before you finish unscrewing the freewheel.

Adjust the wheel bearings just like you would do with a front wheel.
You can sometimes adjust the bearing cones without removing the freewheel by working on the left side only. However, you run the risk that the right side locknut (under the freewheel) is not tight enough against the right side bearing cone to keep it from suddenly turning and locking up the rear wheel or damaging the hub. You can not guarantee that the right bearing cone is secure when just the outer locknut on the freewheel side is tight, so it really is best to remove the freewheel and do it right.

Putting the freewheel back on is much easier. Just screw it on, but carefully. Don't cross-thread!

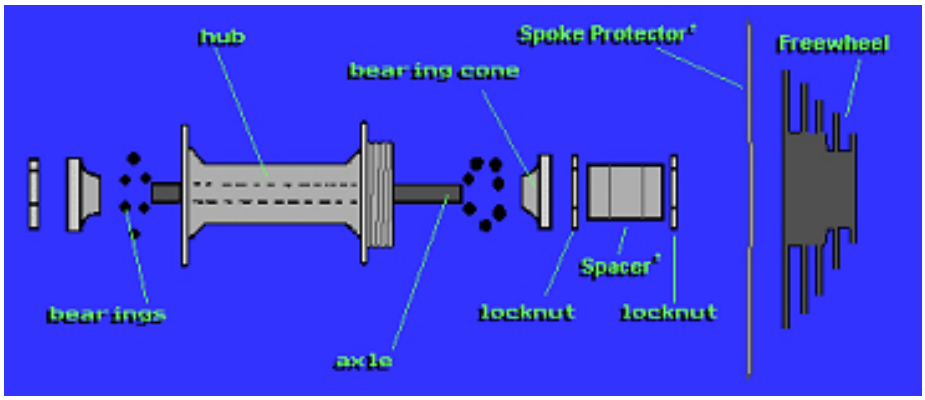


Figure 10: Items marked with * may not be present on all bikes. Outer locknut may be combined with spacer.

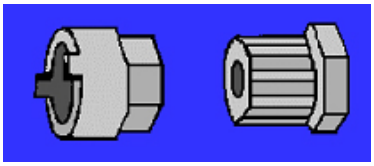


Figure 11: Typical Freewheel Remover

Overhauling

Overhauling rear wheel bearings on most derailleur-equipped bikes is as easy as front wheel bearings, as long as you can remove the freewheel. Overhauling coaster brakes and three-speed hubs is possible, but rather complex. In most, you remove the left bearing cone, then disassemble the hub from the right (sprocket) side. Do not overhaul a coaster brake or three-speed hub unless you are prepared for the possibility that you may not be able to finish the job.

Freewheels - Overhaul, General Care and Troubleshooting

"Freewheel" is the name of the group of sprockets on rear wheels of derailleur-equipped bikes. Overhauling freewheels is possible but not easy or recommended for beginners. Most bicycle shop professionals do not overhaul freewheels. The alternatives are to soak the entire unit in solvent, let it dry, then soak a small amount of oil into it, or to replace it. However, replacing a freewheel should only be done if you replace the chain at the same time. That's because the freewheel's sprockets and the chain wear together. As the chain stretches, the spacing between the sprocket teeth also increases. If you replace only one or the other, you may end up with a skipping effect in the highest gears (smallest sprockets).

If you have an occasional, non-rhythmic skip on a bike with an old chain and freewheel, it is time to replace them. If the skip happens at regular intervals, the problem is most likely a stiff chain link, dirt on the freewheel sprockets, or a damaged sprocket tooth.

Most freewheels have a left-hand threaded plate screwed onto the outer surface of their core. The plate has two holes. You can place a small punch against one of the holes, and tap on it with a hammer. The plate will unscrew, and the freewheel will then fall apart. There are lots of (usually 78) 1/8" ball bearings inside which will fall out.

After cleaning the freewheel, put grease in the grooves in which the bearing balls run, and stick the balls into the grease to hold them in position while reassembling the freewheel. Leave a gap for one or two balls in each groove. Do not grease the ratcheted surface against which the two (sometimes three) pawls ('clickers') run, but instead coat it with a small amount of oil. In cold weather, grease could impede the movement of the pawls. You will find a few very thin shims stacked on the core of the freewheel. These fragile shims are used to adjust the closeness of the bearings. Be careful in handling them, because if you damage one and have to leave it out, the freewheel will usually be too tight to work properly. After reassembling the freewheel, set a punch against one of the two holes in the top plate, and bang repeatedly, but lightly against it to tighten it fully. This plate is rather brittle, so you'll want to apply the force as numerous small hits rather than clobbering it.

Most freewheels have removable sprockets, but for many brands, replacements are unavailable. Sprockets can be removed with a pair of tools made by attaching bicycle chain to bars. While holding one such sprocket tool on a large sprocket, unscrew the smallest sprocket and then the second smallest. Most freewheel sprockets have regular right-hand threading.

Step 5: Wheel Truing

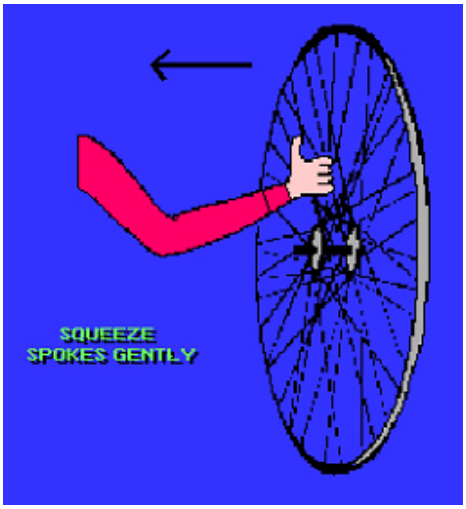
Straightening a bike wheel is more of an art than a science, but it is a skill anyone can learn with enough practice.

The most common wheel problem is a lateral or sideways bend. For a bike wheel laterally out of true, this is what you do:

Leave the wheel on the bike and the tire and tube inflated. Hang the bike up. Turn the wheel around until you find the area which is the most bent. Use the brake pads (perhaps adjusted closer) or a pencil held next to the bike frame to indicate clearly the location of the bend.

If you were to shorten some of the spokes going from the bent area to the side of the hub opposite the direction of the bend, or lengthen the spokes on the side toward which it is bent, the rim would bend back toward the center.

And this is exactly what you do. First, experiment with the effect. Grab a handful of spokes about half-way between the hub and the rim at the brake caliper. Squeeze, which will momentarily bend the spokes, effectively shortening them. You will see the wheel rim move toward the side of the brake.



By turning a spoke nipple clockwise as seen from the top (pretend you can see through the tire and tube), you are shortening the spoke properly.

Generally you work with a group of about four or five spokes at the site of the bend, shortening a few and lengthening some others. Turn the spoke nipples just a half turn or so each, and check the effect. You should loosen some and tighten others because if you were to tighten only, you would create a flat

spot in an otherwise round wheel.

If the bike wheel is quite bent, you may need to work with a larger group, to share the load of pulling the wheel true.

After the wheel is nearly true, tighten whatever spokes are too loose, then finish aligning the wheel.

It is not possible to describe the correct spoke tension. It is something you have to experience for yourself. To know how much to tighten spokes, check several bike wheels using two techniques. Squeeze a handful of spokes at the intersections to see how much they deflect, and turn a few random spokes in various wheels with a spoke wrench. Turn the spokes a half-turn looser, then retighten them the same amount, to get a feel for the correct tightness.

Wheels that require extensive work, or ones that may have an unreliable rim strip should have the tire and tube removed before adjusting spoke lengths to prevent puncturing the inner tube.

If any spokes protrude beyond the tops of the spoke nipples, you will need to file off the excess length.

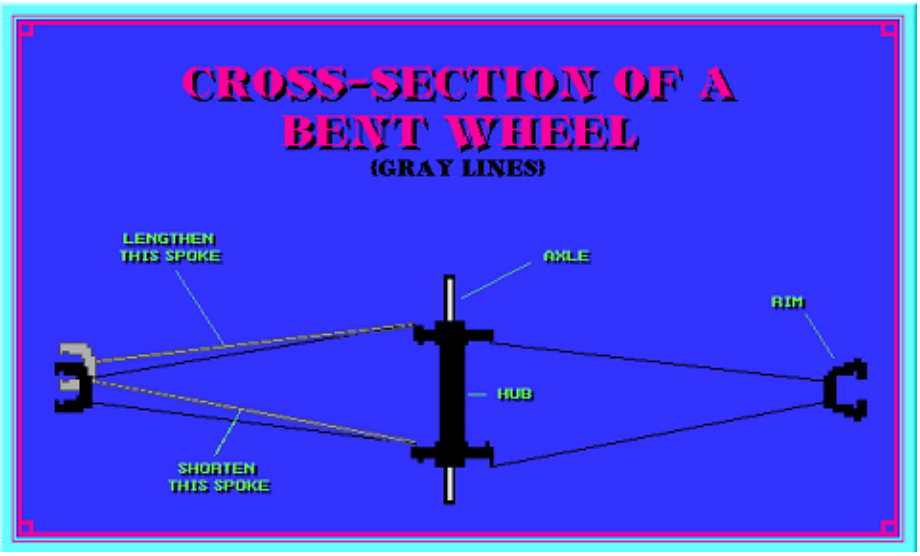
Unbending A Bicycle Bent Wheel

Wheels that are severely bent cannot be repaired easily. You cannot have the spokes pulling hard against a rim that is very bent. This would cause a weak wheel that may bend again, or perhaps some spokes may break eventually.

In the case of severely bent rims you must unbend the wheel before adjusting the spokes. Standing on the wheel, or leaning on it against a table will do the trick. Some people will hit it with a big rubber mallet. However you do it, be sure you are operating on the exact area where the bend is. If you accidentally add another bend, instead of fixing the first one, the repair will be much more difficult.

Severely bent aluminum (also known as "alloy") rims are more difficult to straighten than steel rims because they are springier and more brittle at the same time. If you have done major work on an aluminum rim, check it carefully for visible cracks. If you find a crack, the rim should not be used.

Unbending a wheel is a skill that requires lots of practice to be a reliable repair technique. Good luck!



Flat Spots

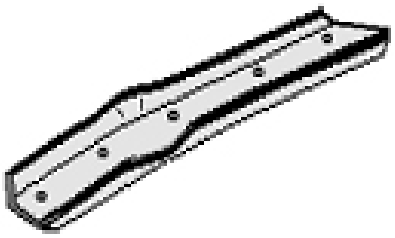
Flat spots can be repaired. Sometimes you can fix one by loosening the spokes at the flat spot and tightening all the other spokes in the wheel. More severe flat spots require removing two or three spokes at the damaged area, hitting the rim outward with a mallet until it bulges out just a little beyond round, then reconnecting and tightening the spokes where the flat spot used to be.

Figure 12: Fixing a flat spot

Kinks

Another common wheel problem is called "kinks." Kinks come from hitting stones, curbs or sharp edges in the road. Keeping the tires fully inflated will reduce the likelihood of kinks occurring. Riding just one inch above the seat when on rough terrain helps too. You can still maintain total control of the bike, but your weight is on the pedals, not the seat, allowing the bike to rock over the bumps, and your knees act as shock absorbers.

Kinks are repaired easily by hitting them back into position with a hammer, or by squeezing the rim with pliers. Use cloth between the pliers and the rim to prevent tooth marks.



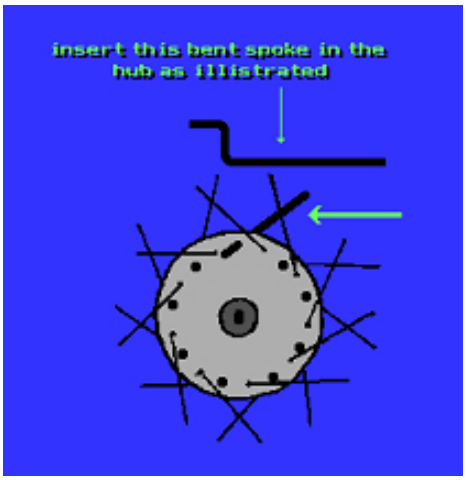
Broken Spokes

If you have a broken spoke, simply replace it before you align the wheel. On a wheel from a derailleur-equipped bike, you will need to remove the freewheel first. (See the section about rear wheel bearings.)

On the road you may not have replacement spokes available. If an mishap has ruined several spokes in one section of a wheel, you can redistribute the remaining spokes to hold the wheel together long enough to get to a bike shop. You can even use a couple of spokes from the other wheel.

On the road, if a spoke has broken near the hub, you can loosen it, bend it around a nearby crossing of spokes, and then retighten it. This spoke will then be able to continue to support the rim until you can replace it with a new one.

If you cannot get the proper length spoke to replace a broken one, you can use a longer one. Cut off the curved end. Bend a dog-leg (double L) in the spoke at the exact place where the end is supposed to be. Even though it looks unlikely to stay properly bent, this home-made replacement will work well.
If you have replaced a spoke which has broken near at the hub, and then others break shortly thereafter, your spokes may be worn out. They can become fatigued (crystallized) at the hub after lots of riding. When this happens, they all need to be replaced. Otherwise, you'll be replacing them one at a time,

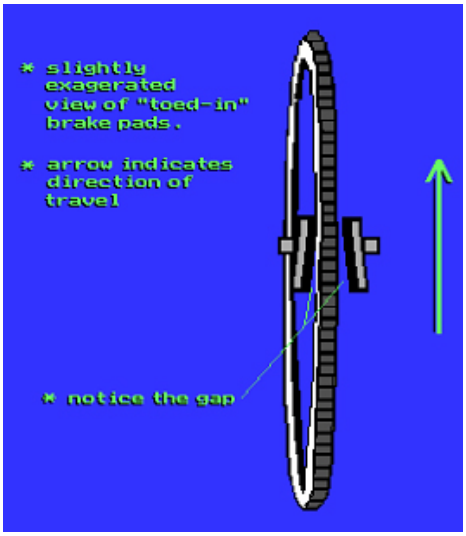


seemingly forever! This condition is common in back wheels, but uncommon in front wheels, since rear wheels carry much more weight.

Step 6: Bike Brake Adjustment

1. Squeeze the bicycle's brake pads against the bikes rim to see if they are at the right height. The bike's brakes should not rub on the tire nor should they be able to slip under the bike rim. (Very dangerous!)

   To prevent squeaking, the bike brake pads should also be "toed-in," which means the trailing (front) edge of the pads should touch the bike rim with the brake applied lightly. When you apply the brake hard, the pads squish a little and you should get full contact to the rim. With most steel brakes on older bikes, you carefully bend the caliper arms to get proper toe-in. With the aluminum alloy cantilever bicycle brakes found on most modern road, mountain, and all other bikes, set the toe-in by adjusting and re-tightening the brake pad holder. Do not bend cantilever brakes, or brakes on old Italian bikes because they are made from a more fragile metal or mounted on posts that can be damaged. Some shimano and other can-



   tilever brakes have springs that can be unhooked while adjusting brake pad alignment and cable tension. Re-hook the springs when done.

2. Look for an adjusting barrel, a long hollow bolt in which the cable housing terminates, but the inner wire goes through. This adjusting barrel may be on the hand lever, or on the brake caliper (the main part of the braking system at the wheel). Screw the barrel all the way in to loosen the cable as much as possible.

3. Loosen the holding bolt, pull the cable inner wire tight while squeezing the brake pads together, and re-tighten the holding bolt. The holding bolt may trap the cable inner wire under a plate or washer to secure it, or

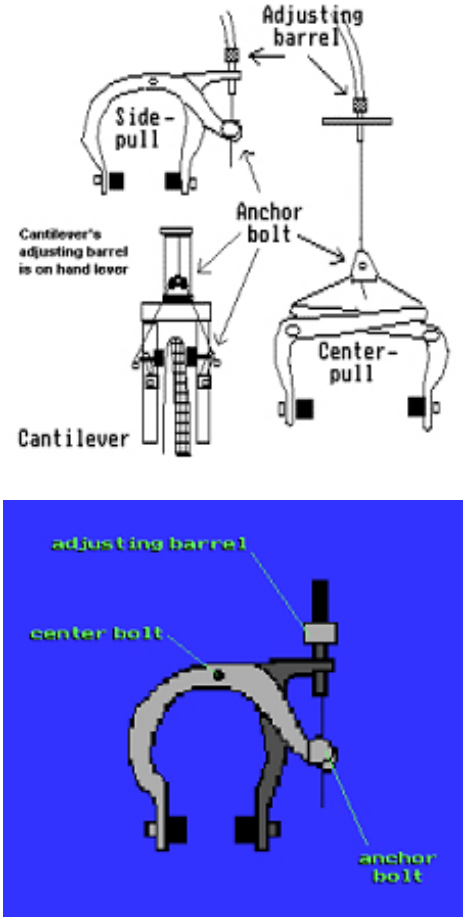


Figure 13: Sidepull break

the holding bolt may have a hold drilled through it to capture the inner wire. Holding bolts Sometimes an assistant is helpful for this step. An expert can usually squeeze the brake pads against the rim with one hand while tightening the holding bolt with the other. If you can't manage it, and don't have an assistant handy, a brake inner wire pulling tool is available. This is called a 'third hand tool.' You may not have a third hand tool. In that case, you can generally grab the inner wire with a pair of pliers just past the holding bolt, and twist, pulling the slack out while tightening the holding bolt with your other hand. The tightness of this bolt is critical. The first mistake most beginning bike mechanics make is to break an holding bolt. Yet, if you don't tighten it enough, when the brake is applied hard in an emergency stop, the cable will slip through the bolt, causing an accident. You must test the bolt by pulling hard on the

Figure 14: Holding bolts

brake hand lever to be sure the cable does not slip. This test is good for cables too. A weak cable will snap. You'd rather have it snap during the test than when riding!

4. You can fine adjust the brake tension by unscrewing the adjusting barrel a little bit. This effectively shortens the cable.

5. Center the brake if it is too close to one side of the rim. Before this step, make sure the wheel is mounted correctly. Sometimes what appears to be a badly centered brake is simply a wheel fastened in slightly sideways.

If It Is A Sidepull Or Centerpull Brake:

Try loosening the mounting nut (that holds the brake caliper onto the bike), holding the brake caliper centered, then retightening the nut.

If the caliper stubbornly returns to the same position, leave the nut tight, then gently bang on the spring with a punch or dull screwdriver and hammer. The impact will cause the position of the caliper to shift.

If It Is A Cantilever Bike Brake:

Many modern brakes have an adjusting screw on both calipers that applies pressure to the spring. The more you tighten the screw, the further away the brake pad will rest from that side of the rim.

Some Shimano cantilever brakes (and "U-Brakes") have a two millimeter allen screw that you turn to adjust centering.

Some Suntour cantilever brakes have an allen head screw that you can loosen, allowing you to reposition the spring, and then retighten.

If no spring tension adjuster is found, most cantilever brakes have the brake pads mounted on rods so that you can loosen the holders, slide the pads to the proper position and retighten. It is difficult to hold the pad in the proper position while retightening. Patience and perhaps a pair of pliers is required.

Sometimes adjusting the position of the pads is insufficient. Release the cable, then check to see if one of the pivots is stiff or sticking. If so, disassemble, clean with sandpaper, apply grease, and reassemble.

6. Check all the nuts and bolts in the braking system (that you have not already attended to) for tightness.

7. Sidepull brakes often need one more adjustment. The centerbolt has two nuts that work like a bearing adjustment to keep the looseness of the brake properly adjusted. If too tight, the brake will not spring open. If set too loose, the brake will grab or chatter.

This brake, representing a very common style, can be opened quickly without tools for removal of the front wheel. Squeeze the brake together and then lift the cable casing out of the clip on right side caliper. To center this brake, tighten or loosen the small screw (Allen or Plillips head, depending on the model). The little screw pushes against the brake caliper return spring, causing the caliper to pull back harder on this side when the screw is tighter.

Replacing A Cable

Examine the brake cables for fraying. Look carefully at the part of the inner wires connected into the hand levers. A cable with even one broken strand is not reliable.

Replacing a cable is easy. At the bike shop you can buy a universal cable. It will be long enough for any bike, and may have two ends on it, one of which will fit any bike.

Using sharp diagonal or wire cutters, cut off the end that does not fit your bike. Pull the inner wire entirely out of the housing (sometimes called "casing"). Lay the housing against your bike and cut it to the proper length. Make sure to allow enough length that the handlebars can be turned fully to either side. Cover the inner wire with grease, then slide it into the housing. Hook the

inner wire into the hand lever, then have an assistant or a clamp (available at bike shops, called "third hand tool") squeeze the brake caliper while you pull the slack out of the cable wire and tighten the holding bolt.

Squeeze the hand lever hard, then loosen the holding bolt, pull more slack out of the inner wire and retighten. Fine adjustment is made by turning the adjusting barrel. Test your work by squeezing the hand lever hard. The cable should not slip.

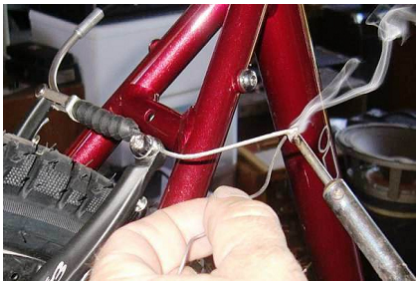
Cut off excess cable wire at least one inch beyond the holding bolt. This will leave you something to pull on the next time you adjust the brake. Solder the end or put a little cap, called a cable ferrulle, on the end of the wire to keep it from unraveling. Ferrulles are available at bike shops which fit over the end of the inner wire, and are squeezed with pliers to fasten them on. Solder is preferable because the cable can be removed and reinstalled without changing the tip, and the solder can't fall off. To solder effectively:

1. If the soldering iron tip is not covered with clean, shiny solder, sand it clean, heat it up, and apply fresh flux and solder to cover the tip.
2. Let the iron heat fully, and apply a bit of solder.
3. Touch the wet solder on the tip of the iron to the inner wire. The wet solder makes greater contact than a dry tip, so the heat will transfer better.

4. Wait until solder touched to the other side of the wire melts, and let it flow in among the strands. Flick the wire (while wearing goggles) if you have an excess blob to shake off.

   Use rosin-core, not acid-core solder. Note that solder won't stick to stainless steel wires, unless you use special stainless solder.

   In case you are wondering about the difference between a soldering iron and a soldering gun: An iron is generally long and thin, has no on/off switch, and is left plugged in and always warm but takes a while to warm up. A soldering gun has a trigger switch and heats up quickly when the trigger is squeezed. I prefer to use a gun to avoid hot clutter on my bench, but used an iron in the picture below.



The Brake Pads

Look at the brake pads. If they are not new-looking, replace them with good quality pads. Expensive ones work best, and the difference can be dramatic, well worth the difference in price. The single most effective improvement in a poor bicycle braking system is to put on the best brake pads you can get.

Diagnosing Brake Stickiness

The most common brake problem is that the brake does not open well after being squeezed.

Apply the brake, not from the hand lever, but by squeezing the caliper itself. If it opens well, the problem is not in the caliper. Squeeze the brake caliper again and with your other hand squeeze the brake hand lever. Let go of the hand lever, but not the brake caliper. Can you move the hand lever easily? If so the problem is in the cable.

If the brake lever is stiff, disconnect the cable to be sure the problem is isolated in the hand lever. A stiff hand lever can sometimes be fixed by applying careful pressure laterally, to free up the pivot. Oil sometimes helps and never hurts if used in a very small quantity.

Hand Levers

Hand levers found on some ten-speed bikes with low curved handlebars sometimes cannot be mounted securely because the brake levers' mountings do not fit the diameter of the handlebar. The best repair is to replace the handlebar or the brake levers.

Extension levers (also known as "safety levers") often have adjustable pivots. You may leave their mounting screws loose if there are springs inside the pivot posts to keep the bolts from unscrewing due to vibration.

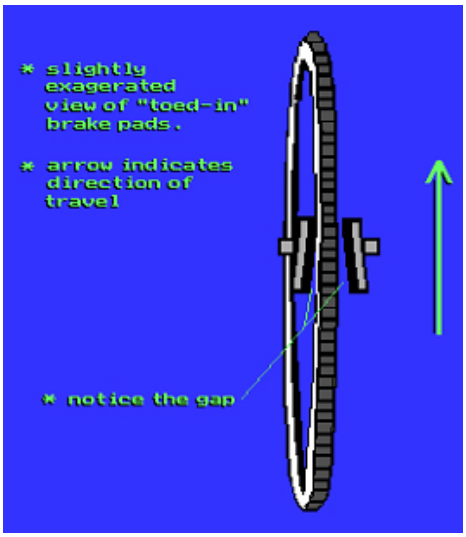
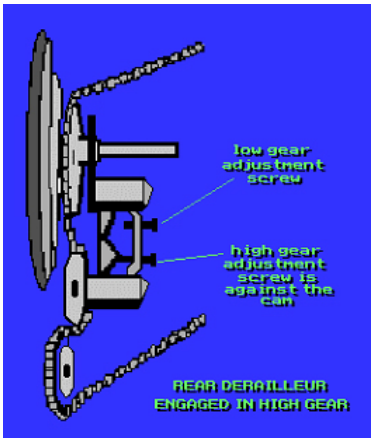


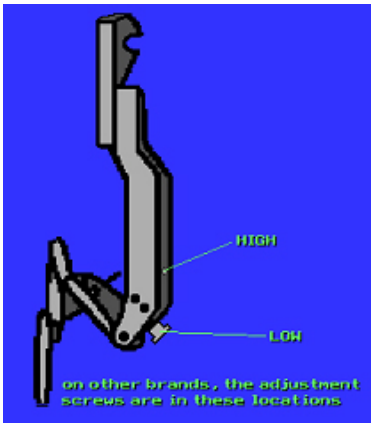
Figure 15: Extension (“Safety”) Levers

Step 7: Adjust The Rear Derailleur

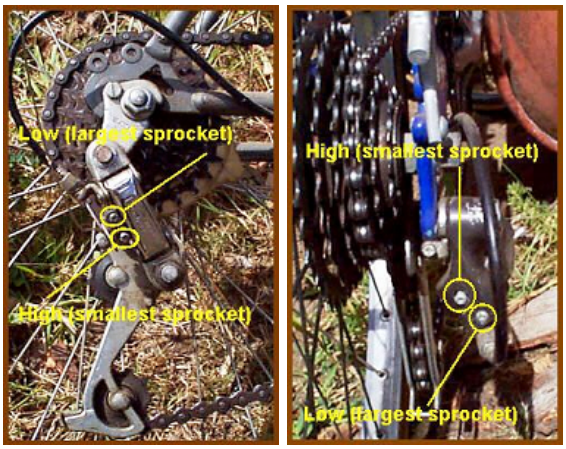
Notice the two small screws on the body of the rear derailleur. (Some Suntour models have three screws. Ignore the top one for now.) The high gear limit screw stops the derailleur from shifting past high gear (smallest sprocket), and the low gear screw prevents it from going past low gear (largest sprocket). If a limit screw is too loose, the chain will fall off. If too tight, the system will not engage the gear.



Locations of the adjustment screws will vary on different brands, but they all function the same way.



1. Tighten the high gear screw, the one that hits a cam when you shift to the smallest sprocket, until you can no longer shift into high gear. Put the shifter in high gear position and while turning the pedals, unscrew the high gear screw until the system engages high gear again. Shift between



high gear and the second smallest several times, backing the screw out a little more, just until the derailleur shifts smoothly.

2. Tighten the low gear screw until you no longer get first gear. Repeat the process for this low gear limit - back the screw out just until the bike shifts smoothly from the second largest to the largest sprocket.

3. If you cannot engage high or low gear, or if the above technique does not work for high or low gear, the cable may be improperly adjusted.

Shift into high gear and push the shifter all the way to the end of its travel. Loosen the cable inner wire anchor bolt. That's the bolt with a hole through which the derailleur control wire is clamped. Pull the slack out of the wire, and retighten the anchor bolt.

If your bike has index shifting, you'll find an adjusting barrel either at the derailleur or the shifter. The adjusting barrel is a hollow screw at which the cable outer housing stops, but which the inner wire continues through. Fine adjust the cable tension by turning the adjusting barrel until the clicks on the shifter correspond with proper shifting at the derailleur.

If your bicycle does not engage high gear, or is slow to engage high gear, even though properly adjusted, the cable is probably the culprit. Replace the sticky or rusted cable, and the problem will usually go away.

If you have done everything right, but the bicycle does not shift reliably, the most common reason is that the chain and freewheel are too worn to work properly. If you replace one, you must replace both. A new chain on an old freewheel or visa versa usually skips, and the new part wears out very quickly.

Another possibility is a bent derailleur. The guide pulleys, those little wheels

that take up the chain slack, must pivot on the same plane as the freewheel sprockets. Derailleurs become bent when the bike falls over on the right-hand side. Whenever you set a bicycle down, or put it in a car, set it on its left side to protect the derailleur. You can sometimes straighten out a bent derailleur by simply bending it back and readjusting the limit screws.

Update: A reader brought to my attention that there is a third screw that I need to address. This is the "b" screw or "chain gap adjustment" screw. It is located right where the derailleur attaches to the hanger and actually pushes the derailleur back in order for the derailleur to keep from contacting the cassette. Simply move your chain to the largest gear and then adjust this screw to barely keep the derailleur from coming into contact with the cassette. Simple! (Carl)

Replacing a Cable

The following situations indicate that the cable needs replacing:

1. The rear derailleur easily engages low gears (large sprockets) but hesitates to engage the smallest sprocket, or doesn't engage it at all. This is after the high gear adjustment has been set, as in the above paragraphs.

2. The shifter is very hard to move. Make sure that the reason is not just that the shifter friction adjustment has been set too tight. Some shifters have a large screw or wingnut that can be adjusted. When too loose, the shifter slips back into high gears when you hit bumps. When too tight, the shifter is hard to move.

3. If you see broken strands on a cable inner wire, it should be replaced. A cable with just one broken strand is less than half as strong as one that's intact.

Hello Jeff

I have read through your web site with much interest, and found your repair section very descriptive and helpful, with very accurate explanations on what to do and how to do it. I am a racing cyclist in South Africa and have been maintaining my own bike now for the last 10 years. I began repairing and maintaining my bike because every time I sent my bike in to a bike shop for a service it came back in a worse condition...gears not being set, brakes not working, etc. I am now at the stage where I feel comfortable enough to build my own bikes (not the frames).

Ok, that's the background, now the main problem: when adjusting the rear derailer (STi or ErgoPower) I usually find that one of the gears (usually about the 6th one up) lags a bit. All the other gears change smoothly and crisply then it just hesitates for a moment on this one gear. What could the problem be? Over the weekend I was looking at the whole setup and decided to adjust a screw which I have never really played with before and it seemed to help a little, but I am scared to say that I have found the problem, so the secon question is: what is the screw on the back of the derailer, which adjusts against the frame (hanger), for?

I would be very happy if you could finally solve my little dilemma for me...

Hi Sheldon,

The 'third' screw, at the derailleur hanger adjusts the angle of the derailleur body. Supposedly, it can bring the derailleur guide pulley closer to a close-range freewheel, and farther away to accomodate a wide-range freewheel, but in most cases, it makes little difference and is seldom used.

As I understand your problem, the bike is slow to shift into the smallest rear sprocket. The most common case is a sticky cable. Replace the cable, and the problem may go away. However, it could be simply that the high gear limit screw is set too close - so you may try loosening that first, as I believe you said you were experimenting with.

Finally, if the chain is quite worn, you can have shifting slowness as you described.
Have fun!

- Jeff -

Step 8: Adjust The Front Derailleur

The front derailleur is adjusted like the rear one - the principles are the same. Look closely to find which limit screw does what since their positions vary on different models of front derailleurs.

1. Make sure the front derailleur cage is parallel to and above the largest front sprocket by only about three millimeters (1/8 inch).

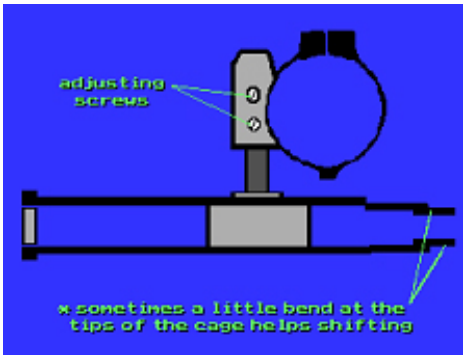
2. With the rear derailleur in high (smallest sprocket), tighten the front derailleur high gear screw until you cannot shift into high gear (large front sprocket). Back out the screw while turning the pedals and operating the shifter until you just get a clean shift every time.

3. Repeat this procedure for shifting down to the smallest front sprocket, but with the rear derailleur engaged in low gear.

4. Check all combinations of front and rear gear selection. You may have to compromise the adjustments a little to get a clean shift in all cases.

5. Because the chainwheels (front sprockets) are probably not perfectly flat, try all combinations of shifting when the pedals are at varying angles of rotation.

Sometimes front derailleurs will require a little bending to get proper function. If the chain sometimes falls off even though the adjustment seems correct, try bending the front edge of the derailleur cage in a little bit.



Top view of a front derailleur If the derailleur is reluctant to engage high or low gear, the cable may need adjustment. Shift toward the largest sprocket, pushing the shifter all the way in its travel. Loosen the cable inner wire anchor bolt, pull the slack out of the cable and retighten.

If that doesn't work, the cable may be sticky or rusted, and should be cleaned or replaced.

If you have done everything right, but the chain still falls off occasionally, or the derailleur is slow to shift, consider the following points:

The chainwheels may be bent. If so, you'll see them waver as you turn the pedals. You can simply bend them back into plane. Do this carefully with a rubber hammer.

One or more teeth of the chainwheels may be bent. You may be able to straighten a bent tooth by grabbing it with an adjustable wrench.

The chain or the chainwheels may be worn out.

The chain or the chainwheels may be of low quality. This is common, and the usual cures are to ignore the problem, or spend money. Keep in mind that to get the performance we do get with bicycles, the engineering is a compromise between reasonable weight, features, and cost. If you want perfection, you've got to pay the price. The price isn't always money. Even if you spent a million dollars for the best bicycle money could buy, you'd still find some aspects of your machine which would be less than satisfactory. Hey, it's either settle, or walk!

Skipping problems are not related to the derailleurs. If your bike has a skip when pedaling hard, check the skip's frequency. If it is once for every revolution of the chain, there is probably a stiff link. Try lubricating and flexing the chain laterally. If the skip is once per each revolution of the front or rear sprockets, look for damage or build up of dirt on the offending sprocket. If the skip frequency is random, the chain and freewheel are probably worn out, requiring replacement for best performance.

Replacing a Cable

The following situations indicate that the cable needs replacing:

1. The front derailleur easily engages high gears (large sprockets) but hesitates to engage the smallest sprocket, or doesn't engage it at all. This is even after the low gear adjustment has been set, as in the above paragraphs.
2. The shifter is very hard to move. Make sure that the reason is not just that the shifter friction adjustment has been set too tight. Some shifters have a large screw or wingnut that can be adjusted. When too loose, the shifter slips back into high gears when you hit bumps. When too tight, the shifter is hard to move.
3. If you see broken strands on a cable inner wire, it should be replaced. A cable with just one broken strand is less than half as strong as one that's intact.

Step 9: Finish The Tune-Up

Check the tire inflation. The proper pressure is molded into the side of the tires. Use the highest recommended pressure for all but a few off-road purposes. Use a known good gauge. The air boxes at gas stations with the crank on the side are often inaccurate. Before adding air to tires, make sure they are seated correctly. If a tire is bulging partly off the rim, you must let most of the air out, reposition the tire, and reinflate it carefully to avoid a blowout.

- Check the tightness of all nuts and bolts that you have not already checked. This includes accessories such as a kickstand, luggage carrier and generator lighting set.
- Carefully test ride to make sure the bicycle is safe.
- Enjoy the satisfaction in knowing you have tuned up the bicycle yourself, and have probably done a better job than many professional tune-ups.